Chapter 2 – Preconception Health

The health of both a pregnant woman and her infant is highly dependent on her health status prior to pregnancy. To this end, the Centers for Disease Control and Prevention has published recommendations to improve health and health care for women during the pre- and interconception periods. Preconception strategies are defined as "a set of interventions to identify and modify biomedical, behavioral, and social risks to a woman's health or pregnancy outcome through prevention and management."[1] These interventions include identifying and modifying medical, behavioral, and social risk factors prior to pregnancy.[1]

Optimizing health for reproductive-age women includes preconception health promotion since many pregnancies are not intended, that is, they are either unplanned or mistimed. By promoting health in all women of reproductive age, better outcomes can ultimately be achieved for both women and infants, regardless of whether there were plans to conceive.

Section 1: Fertility and Intended Pregnancy

Fertility

By 2010, it is estimated that there will be over one million women of reproductive age (defined as 15-44 years) living in Colorado.[2] According to national statistics, approximately 85 percent of all U.S. women will have given birth by age 44 years.[1] Consistent with other developed countries, the average age at first live birth has been increasing in both the U. S. and Colorado.[3] In 1990, the average age at first birth in Colorado was 24.9 years, increasing to 25.8 by 2008. Asian American/Pacific Islander (AAPI) women had the oldest average age at first birth in 2008 (28.8 years), and Hispanic (all races) and American Indian women had the youngest (22.5 and 22.8 respectively). Table 8 displays the increases in average maternal age, by race and ethnicity, between 1990 and 2008.

Table 8. Average Maternal Age at First Birth by Race/Ethnicity, Colorado, 1990-2008

Year	All	White (Non-Hispanic)	Hispanic*	Black (Non-Hispanic)	AAPI (Non-Hispanic)	American Indian (Non-Hispanic)
1990	24.9	25.8	21.4	21.8	25.9	21.3
1995	25.1	26.2	21.5	22.7	26.6	21.4
2000	25.3	26.7	21.8	22.4	27.3	22.2
2005	25.8	27.3	22.3	23.6	28.5	22.4
2006	25.7	27.2	22.3	23.4	28.4	23.5
2007	25.8	27.3	22.6	23.8	28.9	23.3
2008	25.8	27.3	22.5	23.4	28.8	22.8

Source: Colorado Department of Public Health and Environment, Health Statistics Section, Birth Certificate Data
*Hispanic group includes women of all races whose ethnicity is of Hispanic origin.

Colorado's general fertility rate, defined as the number of live births per 1,000 women of reproductive age,[iii] has remained fairly steady since the year 2000, when it was 67.0 per 1,000. In 2007, Colorado's fertility rate was 68.9 births per 1,000 women and decreased slightly to 67.4 in 2008.[4] While trends in Colorado's general fertility rate have not changed significantly in recent years, a dramatic shift has occurred in age-specific rates. The fertility rate of young women, ages 15-24, has steadily declined, while the fertility rate for women ages 25-44, has increased, exceeding that of younger women since 2005. This reversal of the position of the rates, with older women now having a higher rate than younger women, is unprecedented in the time period since the Colorado Vital Statistics program began tracking age-specific rates in 1970 (Figure 5).

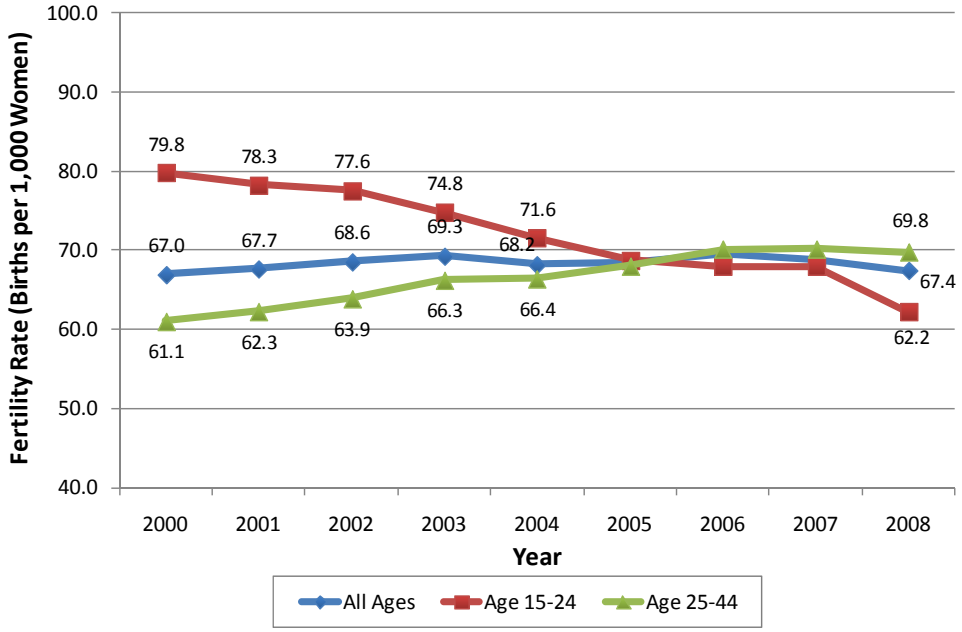

Figure 5. Fertility Rates by Age Groups 15-24 and 25-44, and All Ages, Birth Certificate Data, Colorado, 2000-2008

Source: Colorado Department of Public Health and Environment, Health Statistics Section, Birth Certificate Data

When fertility rates are compared by income level, they are highest among low-income women. A recent Colorado study found that the fertility rate of women ages 19-50, with incomes at or below 200 percent of the federal poverty level (FPL), was 112 births per 1,000 women, compared to 42 births per 1,000 women at incomes higher than 200 percent FPL.[5] Planned pregnancy and contraceptive usage correlate with income; the higher the income, the higher the likelihood of having an intended pregnancy.

[iii] The National Center for Health Statistics estimates that 64 percent of all pregnancies result in a live birth, and the other 36 percent result in either a spontaneous or induced abortion. See National Vital Statistics Report 2008: 56(15): 3 at www.cdc.gov.

In Colorado, White/Hispanic[iv] women consistently demonstrate the highest fertility rate (92.9 births per 1,000, in 2009) among all racial and ethnic groups, including White/non-Hispanic women (56.4 per 1,000 in 2009). American Indian[v] women consistently have the lowest fertility rates (38.4 per 1,000 in 2009). For most racial and ethnic groups, the fertility rate has been fairly consistent since 2000, with the exception of White/Hispanic women, who demonstrated a significant decrease in 2007 and 2008 (Figure 6). However, this may be due in part to a 2007 change in how birth certificate data are collected by race and ethnicity.[vi]

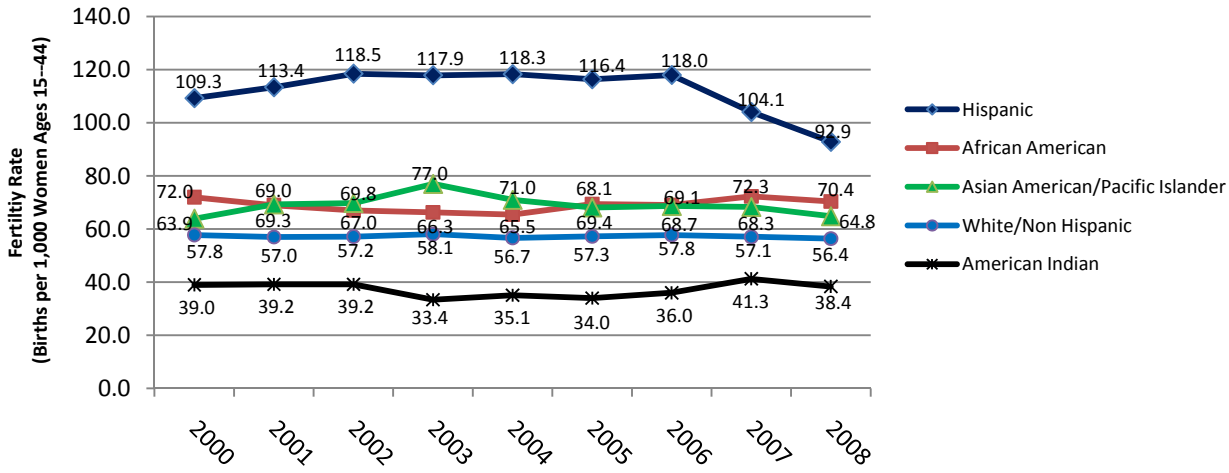

Figure 6: Fertility Rates by Race and Ethnicity, Colorado 2000-2008
Source: Colorado Department of Public Health and Environment, Health Statistics Section, Birth Certificate Data

Intended and Unintended Pregnancy

Unintended pregnancy is defined as one that is either unplanned or mistimed (occurred sooner than desired). Women who are intentional about becoming pregnant are more likely to start prenatal care early, and to adopt healthy behaviors during pregnancy. The national Healthy People 2010 Objective 9-1 is to increase the proportion of intended pregnancies to 70 percent of all births.

In Colorado, women with intended pregnancies are less likely to smoke, and are more likely to take vitamins and supplements with folic acid prior to pregnancy. Based on Colorado's Pregnancy Risk Assessment Monitoring System (PRAMS) data, 63 percent of Colorado live births in 2008 were reportedly intended, which has not varied significantly since 2000.[6,vii]

[iv] Unless otherwise noted in this chapter, "White/Hispanic" refers to the "White/Hispanic" category of the U.S. Census Bureau, which is the population who is White race and also Hispanic ethnicity. It excludes any persons of Hispanic ethnicity categorized as any race other than White; therefore, it does not represent all Hispanic persons. White/non-Hispanic category refers to the population group who is White race and is not of Hispanic ethnicity.

[v] In this reference, American Indian also includes Alaskan Natives as categorized by the U.S. Census Bureau.

[vi] In 2007, Colorado began using the 2003 revisions of the U.S. Standard Birth Certificate, which changed the way race and ethnicity data were collected.

[vii] Rates of intended pregnancy are likely underestimated since PRAMS survey data only includes respondents whose pregnancies resulted in a live birth, and not induced or spontaneous abortion.

The highest rates of unintended pregnancies are found in two groups: low-income women and young women. In 2008, only 42 percent of births to women on Medicaid were intended, compared to 72 percent of births to women not receiving Medicaid.[6, viii] For younger women (ages 15-19) during the same year, only an estimated 36 percent of births were intended. Similarly, only 41 percent of births to women ages 20-24 years old were intended. Intended pregnancies increased significantly after age 24, where 70 percent of births to women ages 25-34, and 67 percent of births to those ages 35 and older were reportedly intended.[6] Reducing unintended pregnancies among young and low-income women would help Colorado reach the Healthy People 2010 objective for intended pregnancy.

Healthy People 2010 Objective 9-3 focuses on increasing contraceptive use to 100 percent among females at risk of unintended pregnancy (and their partners). According to 2004-2007 Colorado PRAMS data, over 40 percent of women who had an unintended pregnancy reported "not doing anything" to keep from getting pregnant. Of these women, 81 percent reported that they did begin to use some form of contraception two to nine months after giving birth.[6] In the same PRAMS survey of women with unintended pregnancies, participants were asked about the type of birth control method used with their partner. Answers were then classified into three categories: effective, ineffective, or no method used. Effective birth control was defined as tubal ligation, vasectomy, birth control pills, birth control shot once a month or every three months, contraceptive patch, IUD, diaphragm/cervical cap/sponge, or cervical ring. Figure 7 illustrates the results of the survey by maternal age. Less than one quarter of all women with unintended pregnancies reported using effective methods of birth control prior to pregnancy. In the age group 35 and older, only 14 percent reportedly used an effective method.

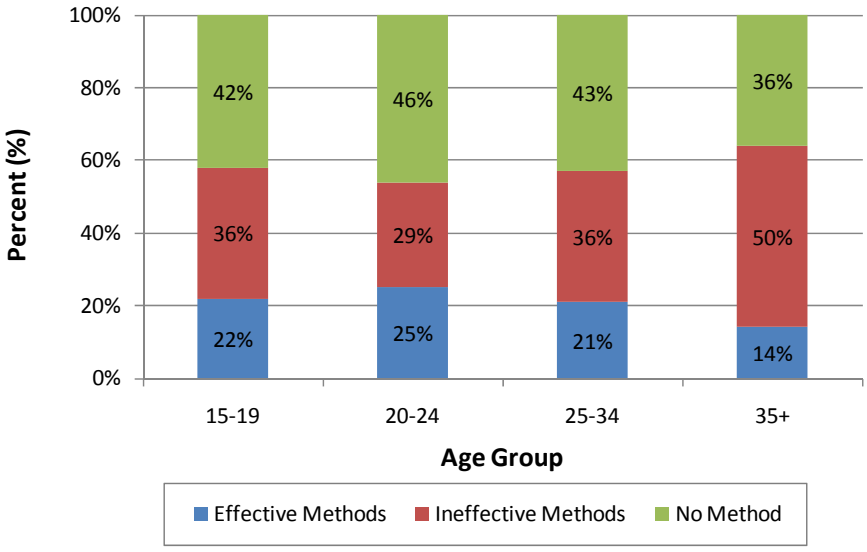

Figure 7. PRAMS Respondents with Unintended Pregnancies by Age Group and Type of Birth Control Method at Conception, Colorado Residents, 2004-2007

Source: Colorado Department of Public Health and Environment, Pregnancy Risk Assessment Monitoring System

[viii] Medicaid coverage can serve as an indicator of low-income, since only pregnant women whose incomes are at or below 133 percent of the federal poverty level are eligible.

Among women with unintended pregnancies who did not do anything to keep from getting pregnant, 32 percent said that they did not think they could become pregnant at that time. Forty one percent of women ages 25 years and older said that they did not mind if they got pregnant, while 32 percent of young women under age 25 noted the same response. Approximately one-third of women ages 15-19 indicated that their partner had not wanted them to use any means of birth control. This response illustrates the need to include partners of younger women in preconception planning. Healthy People 2010 Objective 9-6 focuses on increasing male involvement in pregnancy prevention and family planning efforts. This is consistent with the CDC recommendation that each woman, man, and couple be encouraged to develop a reproductive health plan as a means to improve preconception health.

Section 2: Health Status of Women of Reproductive Age

In terms of overall health status, Colorado women are generally healthy. According to the Colorado Behavioral Risk Factor Surveillance System (BRFSS) for 2006-2008, over 91 percent of women ages 18-44 reported that their health was excellent, very good, or good. The proportion reporting good-to-excellent health increased as household income increased. Among women with household incomes under $25,000 per year, only 77 percent reported good or better health, compared to 90 percent of those with incomes of $25,000 to $49,999, and 97 percent with incomes of $50,000 or more.[7]

Mental Health

According to the BRFSS for 2005-2008, 24 percent of women ages 18-44 reported that they had five or more days in the last month when their mental health was not good (defined by such factors as stress, depression and problems with emotions). This percentage did not vary by race or ethnicity.[7] In 2007, 3 percent of women of reproductive age were estimated to have serious psychological distress, as indicated by specific BRFSS questions added that year.[ix] This rate is comparable to the national rate of serious psychological distress for women ages 18-44.[8]

Diabetes

Approximately one percent of Colorado women of reproductive age have been told by a doctor that they have diabetes. Women with Type 1 and Type 2 diabetes are at increased risk of delivering a child with birth defects.[9] This risk is substantially reduced through proper management of diabetes before pregnancy. Diabetes is more prevalent among Black/African-American women (4 percent) and White/Hispanic women (2 percent), than White/non-Hispanic women (1 percent).[7]

HIV Status and Sexually Transmitted Infections

Preventing the transmission of certain viral infections from mother to infant is a vital, because of the severe and/or life-long consequences to the infant, even though the incidence or prevalence is low. Therefore, though the incidence of Human Immunodeficiency Virus (HIV) in women is low, it is important to test for HIV prior to pregnancy. If HIV infection is identified

[ix] In 2007, the K6 scale was added to the BRFSS as a way to measure serious psychological distress.

prior to conception, antiretroviral treatment can be administered, and women and their partners can be given additional information to help prevent maternal- infant transmission. In Colorado, approximately 52 percent of women of reproductive age have been tested for HIV. Black/African American women have the highest rate of testing (70 percent), compared to White/non-Hispanic women (52 percent), and White/Hispanic women (48 percent).[7]
Early screening, treatment, and prevention of other sexually transmitted infections (STIs) is also important in preventing adverse birth outcomes. Chlamydia and gonorrhea are associated with ectopic pregnancy, infertility, and chronic pelvic pain.[1] A 2009 report by the state's STI/HIV Surveillance Program found that cases of both chlamydia and gonorrhea among Colorado residents increased significantly between 2003 and 2007. Chlamydia and gonorrhea cases among females are most prevalent in younger women: 72 percent of all female cases of chlamydia and 65 percent of all female cases of gonorrhea occurred in women ages 15-24 years old.[10]

Preventing Hepatitis B (HBV infection) in women of reproductive age eliminates risks from the sequelae of HBV infection, e.g., hepatic failure, liver cancer, cirrhosis, and death. It also prevents transmission of HBV infection to infants. According to the BRFSS for 2006-2007, approximately 52 percent of women of reproductive age have ever received the hepatitis B vaccine. During the same time period, the prevalence of vaccination did not vary significantly by race/ethnicity: 54 percent of White/non-Hispanic women, 52 percent African American women, and 47 percent of Hispanic women were immunized.[7]

Section 3: Health Behaviors

To increase the likelihood of a healthy pregnancy outcome, it is important that women increase/maintain healthy behaviors prior to conception, given the incidence of unintended pregnancy and the fact that pregnancy is not always diagnosed early in gestation. Only about 40 percent of women realize they are pregnant as early as 4 weeks gestation, a critical time frame for fetal organ development .[11] To prevent early fetal exposure to potentially harmful factors, healthy behaviors need to be in place prior to conception.

Folic Acid Use

The daily use of folic acid has been shown to reduce the occurrence of neural tube defects. These birth defects occur within 3 to 4 weeks after conception, before most women know they are pregnant. Because neural tube defects occur so soon after conception, the U.S. Public Health Service recommends that all women of reproductive age take 400 micrograms of folic acid daily.[12] Healthy People 2010 Objective 16-16 proposes that 80 percent of non-pregnant women, ages 18-44, consume the recommended amount of folic acid daily.

More women in Colorado are aware that taking folic acid prevents birth defects. In 2006, only 41 percent of women indicated an understanding of the purpose of folic acid, which increased significantly to 58 percent in 2008.[7, 13] Women's understanding of the role of folic acid in preventing birth defects and their use of folic acid supplements are monitored by the Colorado

BRFSS. According to the BRFSS, there has been little change over the last decade in the percentage of women who report taking folic acid daily (44 percent in 2000 compared to 43 percent in 2008).[7, 13]

Women with intended pregnancies are more likely to consume folic acid supplements prior to pregnancy. According to Colorado PRAMS for 2004-2007, 50 percent of women whose pregnancies were intended took multivitamins or prenatal vitamins the month before they got pregnant, compared to 23 percent of those with unintended pregnancies.[6] The proportion of women taking a multivitamin or folic acid supplements daily varies by their educational status. Women with less than a high school education are the least likely to report taking daily folic acid supplements (24 percent), compared to women with a high school education (37 percent), and women with education beyond high school (47 percent), based on results from the BRFSS for 2008.[7]

Minority women are also less likely than White/non-Hispanic women to take multivitamins with folic acid. According to PRAMS data of women who had recently given birth, 14 percent of white/Hispanic women and 21 percent of Black/African American women reportedly took multivitamins before pregnancy, compared with 40 percent of White/non-Hispanic women.[14] This finding is consistent with the 2008 BRFSS telephone survey of all women of reproductive age (18-44 years old), where 25 percent of Hispanic women (all races) reported taking daily multivitamins or folic acid supplements, compared to 50 percent of White/non-Hispanic women.[7] Colorado has yet to meet Healthy People 2010 Objective 16.16 of 80 percent of non-pregnant women, ages 15-44, taking folic acid daily.

Alcohol Use

Excessive use of alcohol is associated with an increased risk of health problems. The current CDC recommendation is that women consume, on average, no more than one alcoholic drink per day, and no more than three drinks on any one occasion. Drinking four or more drinks on one occasion is considered binge drinking. Excessive drinking may disrupt menstrual cycling and increase the risk of infertility, miscarriage, stillbirth, and premature delivery. Women who binge drink are more likely to have unprotected sex and multiple sex partners, both risks associated with unintended pregnancy and sexually transmitted infections.[15]

The BRFSS has been used to monitor alcohol use among Colorado adults by asking respondents about usual and binge drinking within the past 30 days. According to data for 2005-2008, approximately 15 percent of women ages 18-44 years old reported drinking excessively in the last month.[16] For this same period, White/non-Hispanic women ages 18-44 years old reported the highest levels of excessive drinking (18 percent), compared to Black/African-American women (13 percent) and Hispanic women of all races (9 percent).[7] According to a 2009 PRAMS study, women of higher incomes were more likely to report drinking any alcohol three months prior to pregnancy (65 percent of non Medicaid recipients compared to 46 percent of Medicaid recipients).[17]

The level of alcohol use before pregnancy is a strong predicator of use during pregnancy, and there is no safe level of alcohol use while pregnant.[11] Frequent alcohol use is associated with Fetal Alcohol Spectrum Disorders (FASD), a range of health conditions that can occur in an individual whose mother drank alcohol during pregnancy. These effects may include physical, mental, behavioral, and/or learning disabilities with possible lifelong implications.[18] According to the 2008 Colorado PRAMS survey, 58 percent of respondents reported drinking alcohol during the three months prior to conception. This percentage did not vary significantly from the previous five years. Among those women who reportedly used alcohol, 8 percent drank seven or more drinks per week during the three months prior to pregnancy.[19]

Healthy People 2010 recommends that all pregnant women, as well as women who may become pregnant, completely abstain from alcohol. Healthy People 2010 Objective 16-17a proposes to increase abstinence from alcohol among pregnant women to 94 percent.

Tobacco Use

Tobacco use during pregnancy is associated with a number of adverse pregnancy outcomes including low birthweight, small for gestational age, and/or preterm birth, spontaneous abortion, stillbirth, fetal death, and sudden infant death syndrome. Cigarette smoking prior to conception can cause reduced fertility and delayed conception among women.[20] Smoking cessation interventions must begin prior to conception.

Colorado women, ages 15-44 years old, were asked during the BRFSS survey if they have smoked at least 100 cigarettes in their entire life, and, if so, do they now smoke cigarettes every day, some days, or not at all. According to the 2005-2008 BRFSS, an estimated 19 percent of Colorado women ages 18-44 years old reported they were current cigarette smokers.[7] Hispanic women of all races (13 percent) were less likely to smoke, compared to White/non-Hispanic women (21 percent), and Black/African-American women (28 percent).[x] In 2006, Colorado women ages 18-44 had the eighth lowest smoking prevalence (19 percent) of all 50 states and the District of Columbia. The lowest prevalence was among Utah women (10 percent); the highest was among women in West Virginia (34 percent).[21]

Respondents to the PRAMS survey were asked if they had smoked at least 100 cigarettes during the previous 2 years and, if so, whether they had used any tobacco in the 3 months before their most recent pregnancy. Since 2000, the estimated prevalence of smoking prior to pregnancy has fluctuated from a high of 21 percent in 2001 and 2004, to a low of 17 percent in 2008.[22] None of these fluctuations are statistically significant. Cigarette smoking in the three months prior to pregnancy was most prevalent among women on Medicaid (33 percent); women ages 20-24 years old (31 percent), women ages 15-19 years old (28 percent); and among White/non-Hispanic women (23 percent). Smoking prior to pregnancy was also higher among women with unintended pregnancies (30 percent), compared to women with intended pregnancies (14 percent).[19]

[x] The difference in estimated prevalence of cigarette smoking between White/non-Hispanic women (21 %) and African-American women (28%) is not statistically significant.

In an analysis of PRAMS data from 15 states and New York City, the average prevalence of smoking three months prior to pregnancy was 22 percent; Colorado was below this average. Of all sites that reported data from 2000 through 2006, the prevalence of smoking prior to pregnancy decreased significantly only for two states: Utah and New Mexico. The authors concluded that "… efforts to reduce smoking prevalence among female smokers before pregnancy have not been working."[20]

Obesity

Obesity is associated with a number of health conditions such as coronary heart disease, type 2 diabetes, stroke, and some cancers (including colon, endometrial, and breast cancer). Gynecological problems such as abnormal periods and infertility are also associated with obesity in women, as are adverse pregnancy outcomes including: birth defects, infants who are large for gestational age, fetal and neonatal death, labor and delivery complications and, maternal complications (such as hypertension, gestational diabetes, and preeclampsia) (20).[1] Maintaining a healthy weight prior to pregnancy is vital to both the health of women and their infants.

Healthy People 2010 Objective 19-2 proposes to reduce the proportion of adults who are obese to 15 percent. The body mass index (BMI) can be used to measure obesity. A BMI greater than 29 indicates obesity. Respondents to Colorado's BRFSS survey are asked both their height and weight to derive a body mass index (BMI). In Colorado, 19 percent of women of reproductive age in Colorado were considered obese, based on results from the BRFSS for 2006 and 2007.[16] White/Hispanic women had the highest prevalence (25 percent), followed by Black/African American women (23 percent), and White/non-Hispanic women (17 percent).[7] In 2008, close to 18 percent of women who gave birth to a live infant were obese prior to pregnancy.[6] In a study of 25 states and New York City using data from PRAMS surveys in 2004, only one state had a slightly lower obesity rate prior to pregnancy (Utah, 15.7 percent) than Colorado (17.4 percent).[15]

Section 4: Access to Health Care

Many preconception health issues can be addressed through regular and ongoing preventive health care. However, women first need access to such care. Several measures of access are discussed below.

Health Insurance Coverage

Healthy People 2010 Objective 1-1 proposes to increase insurance coverage to 100 percent among all persons under age 65. Approximately 80 percent of women ages 18-44 reported having some form of health insurance in 2008.[7] Between 2003 and 2008, this proportion did not vary significantly. Women ages 35 and older were more likely to have health insurance (85 percent) than those ages 18-24 (74 percent). Approximately 94 percent of women with health

insurance report their health is excellent, very good, or good, compared to only 80 percent of women without health insurance.[7]

Not surprisingly, the cost of medical care was a barrier for those without health insurance. The BRFSS asked women of reproductive age if there was a time in the last 12 months when they needed to see a doctor, but could not because of the cost. During 2006-2008, 19 percent of women answered yes, and 44 percent of the women without health insurance did not see a needed doctor because of cost.[16] Proportionately, more younger women lacked insurance or struggled with the cost of care. An estimated 40 percent of younger women (18-24) reported either having no health insurance or that they were insured but unable to afford the associated costs of care , compared to 26 percent of older women (35-44).[7]

Routine Checkups

Another measure of access to health care is the actual use of health services. An annual checkup provides women the opportunity to discuss preconception issues with their health care provider. According to the 2005-2008 BRFSS, 60 percent of women of reproductive age had visited a doctor or health care provider for a routine checkup within the past year. Women with no health insurance were the least likely to have received a routine checkup (only 37 percent), while women with household incomes of $50,000 or more were the most likely to have completed a routine physical during that time period (68 percent). Sixty-two percent of women in urban areas had a routine checkup in the past year, compared to 54 percent of women in rural areas. This difference was not statistically significant.[7, xi]

In the same survey, 53 percent of women of reproductive age identified one or more of the following risk factors that could be addressed during preconception health care visits:

- 5 or more poor mental health days in the last 30 days
- current smoker
- excessive alcohol use
- obesity
- diabetes

Only 51 percent of women with at least one of these risk factors had seen a doctor or health care worker in the past year for a routine checkup.[7] Having one or more of the above risk factors varied for subgroups of White/non-Hispanics defined by income, but not for Hispanic women. Figure 8 shows that 75 percent of the White/non-Hispanic women with an annual household income less than $25,000 have at least one risk factor, compared to only 47 percent of White/non-Hispanic women with an annual household income of $50,000 or greater. In contrast, regardless of income level, half of the White/Hispanic women have at least one risk factor.[7, xii]

[xi] The sample size of rural women was small, so the ability to detect a true difference between urban and rural women is limited.

[xii] Too few women of other race/ethnicity categories were interviewed during this time period to provide reliable estimates for other racial/ethnic groups.

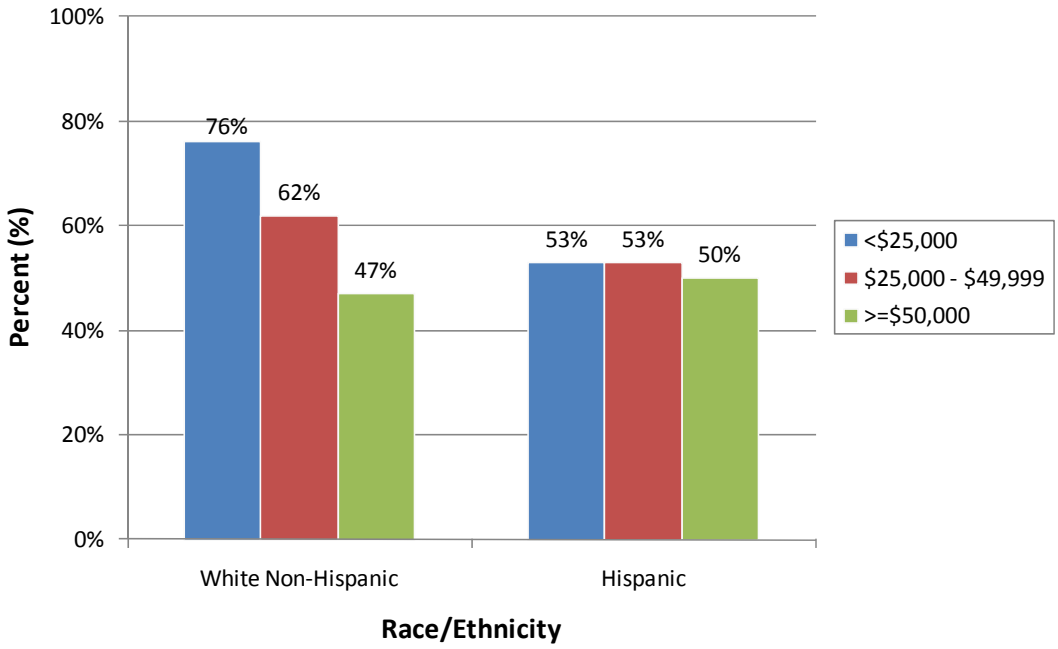

Figure 8. Percentage of Women Ages 18-44 with One or More Preconception Health Risk Factors By Race/Ethnicity and Income, Colorado, 2005-2008

Source: Colorado Department of Public Health and Environment, Behavioral Risk Factor Surveillance System

Oral Health Services

Healthy People 2010 Objective 21-10 proposes to increase to 58 percent the proportion of children and adults who use the oral health system each year. Oral health care for women of reproductive age is especially important. Periodontal disease has been linked with an increased risk for low infant birth weight and preterm birth.[1] Screening for and treatment of oral health problems prior to conception may reduce these risks. In 2008, approximately 68 percent of Colorado women of reproductive age reported visiting a dentist or dental clinic within the past year; 70 percent of women in urban areas and 63 percent of women in rural areas have done so. These three groups exceeded the Healthy People 2010 target of 58 percent.[7]

References

1. Centers for Disease Control. Recommendations to improve preconception health and health care--United States. A report of the CDC/ATSDR Preconception Care Work Group and the Select Panel on Preconception Care. *MMWR Recomm Rep.* 2006;55(RR-6):1-23.
2. State Demography Office. Population by Age and Gender. Colorado Deparment of Local Affairs. 2009.
3. Matthews TJ, Hamilton BE. Delayed childbearing: more women are having their first child later in life. *NCHS Data Brief.* 2009(21):1-8.
4. Colorado Birth Statistics. Available at: http://www.cdphe.state.co.us/cohid/. Accessed December 2009.
5. Ricketts S. Unintended Pregnancy in Colorado: September 2009 Update to the Colorado Reproductive Health Waiver Submitted in 2008. 2009.
6. Colorado Pregnancy Risk Assessment Monitoring System. Health Statistics Section. Colorado Department of Public Health & Environment.
7. Behavioral Risk Factor Surveillance System. Health Statistics Section. Colorado Department of Public Health & Environment.
8. Centers for Disease Control. QuickStats: Percentage of adults with symptoms of serious psychological distress, by age group and sex --- National Health Interview Survey, United States, 2007. *MMWR Morb Mortal Wkly Rep.* 2008;57(27):748.
9. Correa A, Gilboa SM, Besser LM, et al. Diabetes mellitus and birth defects. *Am J Obstet Gynecol.* 2008;199(3):237 e1-9.
10. STI/HIV Surveillance Program. Sexually Transmitted Disease in Colorado Surveillance Report through December 31, 2007.
11. Floyd RL, Decoufle P, Hungerford DW. Alcohol use prior to pregnancy recognition. *Am J Prev Med.* 1999;17(2):101-7.
12. Division of Birth Defects. Folic Acid. Available at: http://www.cdc.gov/ncbddd/folicacid/index.html. Accessed January 2010.
13. Bol K, Tolliver, R.,Montgomery, A., Rickard, R.,. Knowledge and Consumption of Folic Acid: Working to Reduce Neural Tube Defects in Colorado. *Health Watch.* 2007;64.
14. Cofield E, Ricketts, SA. Comparing Maternal Indicators among Black Women to White and Hispanic Women in Colorado: An Anlysis of Pregnanacy Risk Assessment Monitoring System (PRAMS) Survey Data. *Health Watch.* 2007;61.
15. Centers for Disease Control. Preconception and interconception health status of women who recently gave birth to a live-born infant--Pregnancy Risk Assessment Monitoring System (PRAMS), United States, 26 reporting areas, 2004. *MMWR Surveill Summ.* 2007;56(10):1-35.
16. McCubbin JA, Lawson EJ, Cox S, Sherman JJ, Norton JA, Read JA. Prenatal maternal blood pressure response to stress predicts birth weight and gestational age: a preliminary study. *Am J Obstet Gynecol.* 1996;175(3 Pt 1):706-12.
17. Donovan KAM, Tolliver, R. Maternal Indicators for Women on Medicaid in Colorado: An Analysis of Pregnancy Risk Assessment Monitoring System (PRAMS) Survey Data. *Health Watch.* 2009;70.
18. National Organization on Fetal Alcohol Syndrome: Frequently Asked Questions. Available at: http://www.nofas.org/faqs.aspx?id=15. Accessed June 2010.
19. Centers for Disease Control. Pregnancy Risk Assessment Monitoring System. U.S Department of Health & Human Services.

20. Centers for Disease Control. Trends in smoking before, during, and after pregnancy - Pregnancy Risk Assessment Monitoring System (PRAMS), United States, 31 sites, 2000-2005. *MMWR Surveill Summ.* 2009;58(4):1-29.
21. Centers for Disease Control. Smoking prevalence among women of reproductive age--United States, 2006. *MMWR Morb Mortal Wkly Rep.* 2008;57(31):849-52.
22. Bukulski M, Osborne D, Ricketts S, Tolliver R. Smoking Before, During and After Pregnancy: Colorado Trends. *Health Watch.* 2010(75):1-6.